Fiscal Year:	FY 2021	**Task Last Updated:**	FY 02/01/2021
PI Name:	Clark, Torin K. Ph.D.		
Project Title:	A Non-Pharmacological Countermeasure Suite for Motion Sickness Induced by Post-Flight Water Landings		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Sensorimotor**:Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	80303-7813	**Congressional District:**	2
Comments:	NOTE: PI moved to University of Colorado after NSBRI Postdoctoral Fellowship concluded in late 2015 (Ed., 9/1/17)		
Project Type:	Ground	**Solicitation / Funding Source:**	2019-2020 HERO 80JSC019N0001-HHCBPSR, OMNIBUS2: Human Health Countermeasures, Behavioral Performance, and Space Radiation-Appendix C; Omnibus2-Appendix D
Start Date:	01/01/2021	**End Date:**	12/31/2023
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	DiZio, Paul Ph.D. (Brandeis University) Lawson, Benton Ph.D. (Self) Oman, Charles Ph.D. (Massachusetts Institute of Technology)		
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Task Description:	To mitigate astronaut motion sickness during capsule water landings, we aim to assess the benefit of providing Earth-fixed, external visual references, and enabling active postural control to increase head and torso stability, in a series of ground-based laboratory experiments. Re-exposure to Earth gravity, combined with the passive motion of the capsule in the sea is expected to cause varying degrees of motion sickness in most astronauts. In our laboratory experiments, we will use sustained hyper-gravity centrifugation and a visual reorientation paradigm to mimic adaptive responses to gravity-transitions experienced by astronauts. Immediately following, we will use our motion simulators to expose subjects to passive motions relevant for those expected for a capsule at sea. With the standard Motion Sickness Questionnaire, we will first quantify the prevalence, severity, and time course of resulting motion sickness. Next, we will systematically evaluate approaches which have been reported, mostly anecdotally, to benefit terrestrial seasickness, theoretically by helping anticipate the incoming sensory information and reducing the resulting sensory conflict. This includes 1) providing external visual reference cues within the capsule and 2) requiring the subject to try to keep their head and/or torso upright during the passive simulated sea-motion. We hypothesize external visual references will help subjects anticipate inertial motion cues (e.g., vestibular) that are otherwise unpredictable in a closed capsule. Given the emerging relationship between posture and motion sickness, we hypothesize subjects with their head and torso unrestrained and required to maintain alignment with upright during the passive motion stimulation will again help reduce sensory conflict and thus mitigate motion sickness. While these approaches are anecdotally-promising and grounded in sensory conflict theory, they have not been systematically assessed for the scenario of post-flight water landings. Through our experimental evaluations, we will develop a better scientific understanding of the mechanisms of motion sickness induced by post-flight water landings. Our planned countermeasure approaches are readily implementable within the capsule (e.g., providing external visual cues with projection displays or virtual reality) and should have no side effects. In fact, we hypothesize our non-pharmaceutical approaches can lead to reduced dosages of anti-motion sickness medications (e.g., promethazine), which do have undesirable side effects. If successful, these approaches will have substantial significance in reducing astronaut motion sickness post-water landings, which can otherwise impair mission performance and egress.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2021.
Bibliography Type:	Description: (Last Updated: 11/26/2024)